

**MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL
(MARSSIM) WORKGROUP MEETING NOTES - DRAFT**

TUESDAY, NOVEMBER 30, 2004

ATTENDEES:

U.S. Environmental Protection Agency - OSWER/ERT-West: C. Petullo
U.S. Environmental Protection Agency - Headquarters: K. Snead
U.S. Environmental Protection Agency - Headquarters: L. Bender
U.S. Environmental Protection Agency - NAREL: V. Lloyd (by phone)
U.S. Environmental Protection Agency - Region II: N. Azzam
U.S. Environmental Protection Agency - Region II: P. Giardina
U.S. Nuclear Regulatory Commission - RES: R. Meck
U.S. Nuclear Regulatory Commission - RES: G. Powers
U.S. Air Force: R. Bhat (by phone)
U.S. Air Force: Major D. Caputo
U.S. Navy: S. Doremus
U.S. Army: D. Chambers (by phone)

MEMBERS OF THE PUBLIC:

Cabrera Services, Inc.: S. Hay (U.S. Air Force Contractor)
Cabrera Services, Inc.: N. Berliner (U.S. Air Force Contractor)

DISCUSSION

P. Giardina welcomed the MARSSIM Workgroup to the EPA Region II offices in New York. He stated that MARSSIM had become well known within the industry and had a significant impact on the way surveys were performed at radiation sites. He requested that the Workgroup keep the potential impact of MARSAME in mind during development of the supplement.

The Air Force contractor briefed the Workgroup on the statement of work providing technical support to the Workgroup for development of the MARSAME supplement. The time and materials contract provides technical support for the development of an intra-agency review (IAR) draft of MARSAME. The contractor will develop and revise Chapters 1 through 5, associated appendices, and three case studies. In addition, the IAR draft will contain a glossary,

table of contents, and index developed by the contractor. The period of performance ends May 31, 2005.

INTERAGENCY STEERING COMMITTEE ON RADIATION STANDARDS (ISCORS)

C. Petullo reminded the Workgroup there is a meeting of ISCORS Wednesday December 8 from 10:30 to 12 PST. The discussion of bringing the MARSSIM Workgroup under ISCORS as a subcommittee will be discussed. The number of phone lines is limited to the number of ISCORS members plus C. Petullo to represent the Workgroup. C. Petullo has informed the ISCORS members that she is the chairperson of the Workgroup and does not represent any of the agencies on the MARSSIM Workgroup. The request that the agency representatives from the MARSSIM Workgroup be allowed to participate in the conference call was rejected by ISCORS. Two of the ISCORS member agencies (EPA and NRC) have temporary representatives to ISCORS, so it may be possible to delay the decision until the new representatives from these agencies are assigned.

AGENCY UPDATES

For EPA, K. Snead reported there is a Superfund meeting scheduled for March 15 to 18, 2005, in New Orleans, LA. K. Snead and C. Petullo are scheduled to give a presentation on MARSAME at the meeting. EPA's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, AL has a new director. R. Fraass, formerly Executive Director of the Conference of Radiation Control Program Directors, Inc. (CRCPD), has started his duties as director of NAREL. V. Lloyd reported that he has expressed interest in the development of the MARSAME supplement. J. Goodman from the Bureau of Environmental Radiation in New Jersey has expressed an interest in MARSAS. There are several sites in New Jersey where subsurface radiation issues have been identified, and accelerating the development of MARSAS would be useful for providing guidance to the State regulators. C. Petullo stated that the Office of Solid Waste and Emergency Response (OSWER) is interested in applying MARSAME to chemical contaminants. There is a possibility that there will be a pilot study for chemical contaminants performed concurrent with a radiological pilot study.

S. Doremus stated that the Navy has been applying the ideas discussed in the Workgroup. For subsurface issues they have been investigating random surface locations. A combination of random and judgment (based on highest borehole logging results) depth intervals are used to determine subsurface radiological conditions.

G. Powers stated that version 4 of the Spatial Analysis and Decision Assistance (SADA) software was scheduled for release prior to Christmas. There are approximately 28 procedures available for investigating the subsurface (location and depth of samples). The oil industry has expressed interest in the development of the software. NRC is in the very early stages of developing a NUREG providing guidance on planning, implementing, and assessing subsurface

radiological surveys. The NRC will be presenting information on SADA at a meeting in Glasgow, Scotland in 2005.

NUREG-1640 TUTORIAL

R. Meck provided a brief tutorial on the method used to convert volumetric action levels to surface action levels in NUREG-1640. It was not possible to address radionuclide heterogeneity in M&E. It was assumed that the radionuclides would be homogeneously distributed throughout M&E for most options for disposition. For example, radioactivity in recycled scrap metal would be homogeneously distributed when the scrap metal was melted.

The NRC analyzed the total mass of M&E expected from licensees for ferrous metal, aluminum, copper, and concrete. The vast majority of the M&E is expected to come from decommissioning of light-water reactors. NRC identified components constructed from each material (e.g., M&E made from ferrous metals) for both pressurized water reactors and boiling water reactors. Based on the total mass of each material, a list of components providing the majority of the total mass was created (e.g., 153 components for ferrous metals). For each component, the mass and surface area were calculated. All of the major components have relatively simple geometries (e.g., pipe, plate, rod, valve) so the surface area calculations were not complicated. The NRC assumed that only one surface would be radioactive (e.g., the inside of a pipe) and that highly activated components would be disposed of as radioactive waste. European Commission Radiation Protection Report No. 101 looks at the single surface assumption.

The total surface area of all the M&E was calculated, and divided into the total mass to provide a conversion factor with units of g/cm^2 . The mean total single surface activity was calculated and used to determine the annual dose in Sv/y . Eighty-six potential scenarios were investigated by the NRC to identify which was most restrictive (i.e., the critical group scenario) for individual radionuclides in each material. Using the assumption that one gram equals one Bq, action levels were calculated with units of Sv/y per Bq/g. Multiplying these volumetric action levels by g/cm^2 (the volume to surface conversion factor) provided surface action levels in units of Sv/y per Bq/cm^2 .

NUREG-1640 provides the results of these calculations that, in turn, enable the derivation of dose-based action levels. The volumes and conversion factors for each of the critical group scenarios are provided. MARSAME can examine all of the critical group scenarios and select the smallest volume and surface area as a default survey unit size. By definition, all other scenarios would use larger survey unit sizes so this would be a conservative default that could be included in the guidance.

CHAPTER 4

The Workgroup started discussing Chapter 4. No revisions were provided by the contractor, so the discussion started with a review of revision 6 from May 2004.

R. Meck commented on the discussion of classification in Section 4.3. The suggested change was to define Class 1 as M&E with a reasonable probability that there are locations that exceed the action level, Class 2 as M&E that is impacted but won't exceed the action level, and Class 3 as M&E with a small probability of being impacted. The Workgroup correctly noted that Class 3 M&E are always impacted and R. Meck agreed. The Class 3 definition is different from the definition in MARSSIM. It was also suggested that a special case be included to explicitly address M&E too expensive for disposal.

The Workgroup also discussed the definition of 100% measurable and how it applies to a scan-to-release survey design.

There was a discussion of potential survey design options. The Workgroup prepared a table of survey design options based on classification and type of survey and criteria for rejecting Scenario A null hypotheses.

Table 1. Survey Design Options

Survey Type	Class 1	Class 2	Class 3
Scan Only with threshold	Scan 100% All Data < AL	Scan 100% All Data < AL	Scan 100% All Data < AL
Scan Only with data logging	Scan 100% Average < AL	Scan 10-100% Average < AL	Scan 10% Average < AL
MARSSIM fixed and scan	N independent of class Scan 100%	N independent of class Scan 10-100%	N independent of class Judgmental Scan

AL = Action Level

N = statistically determined number of fixed measurements

R. Meck suggested a method for determining the percent area to scan for Class 2 M&E. The ratio of the LBGR to the action level could be used as the fraction of M&E to be scanned. If the LBGR is 1 and the action level is 10, 10% of the M&E would be scanned. If the LBGR is 5 and the action level is 10, 50% of the M&E would be scanned. For this application, the LBGR would be defined as the expected average concentration and would be in the same units as the action level. The results of the survey would be used to verify the assumed LBGR used to design the survey.

ADJOURN

Meeting Date: December 1, 2004
Date Prepared: December 7, 2004

**MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL
(MARSSIM) WORKGROUP MEETING NOTES - DRAFT**

WEDNESDAY, DECEMBER 1, 2004

ATTENDEES:

U.S. Environmental Protection Agency - OSWER/ERT-West: C. Petullo
U.S. Environmental Protection Agency - Headquarters: K. Snead
U.S. Environmental Protection Agency - Headquarters: L. Bender
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U.S. Nuclear Regulatory Commission - RES: R. Meck
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U.S. Air Force: R. Bhat (by phone)
U.S. Air Force: Major D. Caputo
U.S. Navy: S. Doremus
U.S. Army: D. Chamber (by phone)

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CHAPTER 4 (continued)

The Workgroup reviewed the table from the previous day. G. Powers stated that classification can be problematic, and may need to be changed midstream. MARSAME needs to provide guidance for changing classification, and this guidance will be difficult to develop.

G. Powers also pointed out that M&E is different from real property because M&E can be three-dimensional, where MARSSIM surveys are two-dimensional. For example, a steel plate has two sides and both sides may be impacted. In addition, each side may have a different classification. This could increase the survey effort from design to implementation, and through assessment.

The Workgroup requested that the contractor explain the difficulties associated with the development of Chapter 4, and what the Workgroup could do to clarify what guidance should be

provided. The contractor stated that there are several topics the Workgroup has discussed over the past several meetings that do not currently appear in any of the MARSAME chapters. The Workgroup continued their discussion of Chapter 4 by following the flowchart in Chapter 1. This overview will identify where additional guidance is required and identify what topics need to be discussed in Chapter 4.

The Workgroup discussed Figure 1.1 and the structure of Chapter 2 and Chapter 3. The revised flowchart for Figure 1.1 is provided. R. Meck suggested that Chapter 3 include a new section providing guidance on determining if M&E meet the requirements of an existing survey design. If an existing survey design is acceptable the user skips Chapter 4 and goes straight to implementation. The guidance should be similar to the guidance on review of DQOs from EPA QA/G-9, *Guidance for Data Quality Assessment*. The Workgroup developed revised outlines for Chapter 2 and Chapter 3.

Chapter 2 - Initial Assessment of Materials and Equipment

- 2.1 Introduction (Old Section 2.1)
- 2.2 Decide if the M&E are Impacted (Old Section 2.2)
- 2.3 Develop a Preliminary Description of the M&E (New)
 - 2.3.1 Physical Characteristics (Old Section 2.4)
 - 2.3.2 Radiological Characteristics (Old Section 2.5)
- 2.4 Design and Implement Preliminary Surveys (Old Section 2.3)
- 2.5 Prepare a Final Description of the M&E (New)
 - 2.5.1 Physical Characteristics (New)
 - 2.5.2 Radiological Characteristics (New)
- 2.6 Segregate the M&E (Old Section 2.6)
- 2.7 Select an Option for Disposition (Old Section 2.7)
- 2.8 Document the Results of the IA (Old Section 2.8)

Chapter 3 - Identify Inputs to the Decision

- 3.1 Introduction (Old Section 3.1)
 - Define decision rule and structure Chapter 3, other considerations, resource constraints
- 3.2 Select Action Levels (Old Section 3.2, refer to Appendix E)
- 3.3 Specify the Population Parameter of Interest (New)
 - 3.1 Survey Unit Boundaries (Old Section 3.3)
 - Discuss target population, i.e., what we want to measure
 - 3.2 Measurement and Analysis Methods (Old Section 3.5)
 - Discuss MQOs, i.e., how we measure
- 3.4 Identify Alternative Actions (New)
 - 3.4.1 simple, what to do if the results are above or below the action level
 - 3.4.2 “clean-as-you-go,” make a decision, resurvey, make another decision
 - 3.4.3 revise inputs to the decision, revisit earlier DQO steps, looping
- 3.5 Develop a Decision Rule
- 3.6 Evaluate an Existing Survey Design

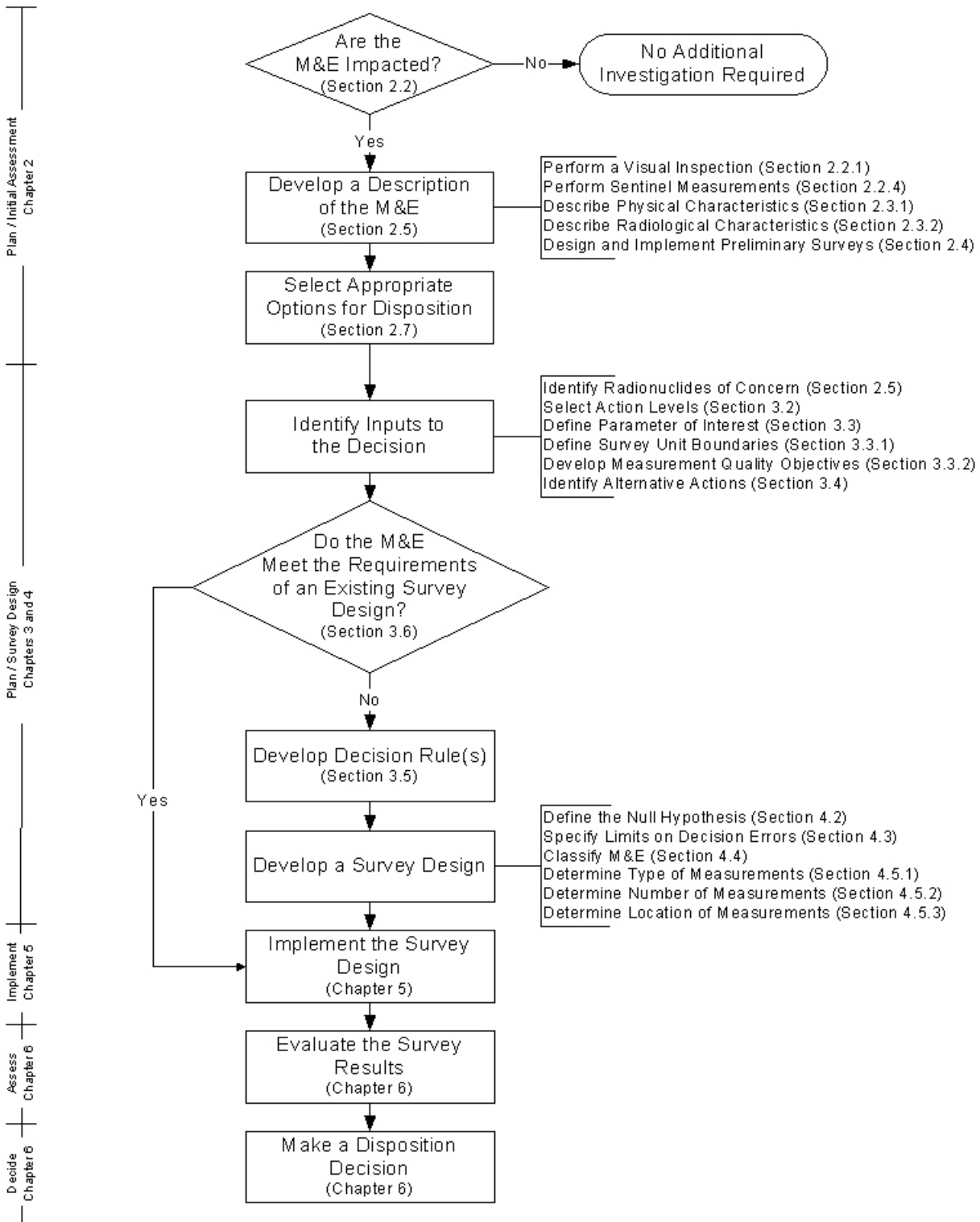


Figure 1.1 The Data Life Cycle Applied to Disposition Surveys

MARSAME guidance should repeatedly refer the user to the flowcharts to reinforce the importance of the process and emphasize the iterative nature of survey design. Also, the flowcharts should include references to the appropriate sections of MARSAME so the user can readily find more detailed discussions on important topics.

The Workgroup discussed the need to address resource constraints in Section 3.1. The inherent value of the M&E will be a factor in determining the options for disposition (e.g., disposal versus remediation and reuse). There are inputs to the decision other than action levels, survey unit boundaries, and measurement methods. These other inputs, including cost, need to be discussed in Section 3.1.

The Workgroup discussed possible structures for the Chapter 4 guidance. The current structure of Chapter 4 was discussed, and Section 4.3 was identified as a potential problem. Section 4.3 is currently structured similar to MARSSIM where the potential survey designs are based on classification. The contractor pointed out that there is little or no difference in many of the survey designs based on classification. The Workgroup returned to the table of potential survey designs from the previous day, which is based on measurement method and classification. The survey design for scan only surveys with a threshold does not change based on classification. Similarly, the number of fixed measurements for a MARSSIM-type survey is independent of classification. R. Meck stated that this is where the guidance moves from the theoretical to what is practical, and Chapter 4 can be structured based on measurement methods.

MARSSIM guidance provides a “two-pronged” survey design; one to evaluate the average activity in the survey unit for demonstrating compliance, and one to identify small areas of elevated activity that could invalidate the statistical basis of the survey design. Survey units that fail the statistical test do not demonstrate compliance. However, identification of small areas of elevated activity lead to additional investigation and do not mean the survey unit does not demonstrate compliance with the release criterion. The $DCGL_w$ used to evaluate the average activity is an action level derived from a dose- or risk-based release criterion. The $DCGL_{EMC}$ is an investigation level that helps identify areas requiring additional investigation before a decision about the survey unit can be made.

MARSAME is different because of the variety of action levels that may be applied to M&E. If the selected action levels include an average criterion and a criterion for small areas of elevated activity, a MARSSIM-type survey can be performed. One example of this type of action level is DOE Order 5400.5, Table IV. However, action levels from NUREG-1640 only consider the average activity because the assumption is that the activity will be homogenized or blended before a dose is delivered, so the average is the only population parameter of interest.

Classification does not apply to all survey designs, but it does apply to some. Chapter 4 needs to provide a discussion of classification before discussing survey design.

The Workgroup decided that the default for MARSAME is that 100% of all M&E being considered for some type of disposition needs to be measured. This means physically placing an instrument on or near the M&E to get an estimate of the radionuclide concentrations. The results of the survey must be able to estimate the activity anywhere in all M&E.

Chapter 4 should describe the statistically based decision making process, i.e., null hypothesis, Scenario A, Scenario B, and limits on decision errors. There needs to be a discussion on classification for those survey designs with a graded approach. Guidance needs to be provided on reducing the measurement requirements below 100%. This guidance should be based on the population parameter of interest (e.g., maximum, mean, percentile), measurement method MQOs (e.g., MDC, MQC), physical characteristics (e.g., both sides of a plate, difficult to access areas), and radiological characteristics (e.g., uniform or spotty distribution, surface or volumetric, energy of radiation, surrogates). If less than 100% of the M&E are measured, the locations of the measurements need to be selected. Random locations are best for providing estimates of the average activity, while systematic grids are best for describing the maximum area that was not surveyed. The guidance should discuss how to select measurement locations, although the actual selection will be discussed in Chapter 5. The draft Spanish guidance document can be used to help structure the examples based on parameter of interest, instrumentation, and type of measurement.

The types of measurement methods should be described in broad terms, such as scan or fixed measurements. There are too many types of measurements and combinations of measurements to develop a comprehensive list. New technologies could make such a list obsolete and require frequent revisions to the supplement to keep it up to date. In general, measurements are scans or fixed. Scans are relatively short measurements that are spatially correlated, such as continuous scanning with hand-held instruments, conveyors, and portal monitors. Fixed measurements are relatively long (compared to scans) and are assumed to be spatially independent. Examples include stationary in situ measurements, box counters, and samples sent for laboratory analysis. D. Caputo reminded the Workgroup that all radiation measurements include some time integration, even scans.

The Workgroup developed a possible outline for Chapter 4.

Chapter 4 - Survey Design

- 4.1 Introduction
- 4.2 Statistical Decision Making
 - 4.2.1 Null Hypothesis (Old Section 4.2)
 - 4.2.2 Scenario A
 - 4.2.3 Scenario B
 - 4.2.4 Specify Limits on Decision Errors
- 4.3 Classification (Old Section 3.4)

277 4.4 Survey Design
278 describe type of measurements, number of measurements or area to be surveyed,
279 locations to be surveyed, rationale for measuring less than 100%
280 4.5 Documentation
281 4.5.1 Operational Surveys (SOPs)
282 4.5.2 Decommissioning Surveys
283 4.5.3 Special Surveys, One-Time Applications

284 MARSSIM SCAN ONLY SURVEY FAQ

285 C. Gogolak provided a draft FAQ on the use of scan only surveys with MARSSIM. The
286 Workgroup determined that each response should be stand alone and start with the word “yes,”
287 “no,” or “it depends” to make the response obvious. The Workgroup decided to review the FAQ
288 individually. C. Gogolak will be available to receive comments during Thursday’s meeting.

289 ADJOURN

Meeting Date: December 2, 2004
Date Prepared: December 8, 2004

**MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL
(MARSSIM) WORKGROUP MEETING NOTES - DRAFT**

THURSDAY, DECEMBER 2, 2004

ATTENDEES:

U.S. Environmental Protection Agency - OSWER/ERT-West: C. Petullo
U.S. Environmental Protection Agency - Headquarters: K. Snead
U.S. Environmental Protection Agency - Headquarters: L. Bender
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U.S. Navy: S. Doremus
U.S. Department of Homeland Security: C. Gogolak (by phone)

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MARSSIM SCAN ONLY SURVEY FAQ (continued)

The Workgroup continued their discussion on the FAQ. The Workgroup discussed the reason for preparing a FAQ. The FAQs posted on the MARSSIM website provide information that will be incorporated into MARSSIM and are endorsed by the MARSSIM Workgroup. The information provides clarification on guidance in MARSSIM, but is not important enough to justify a revision to the manual. The scan only survey FAQ provides clarification on the guidance provided in Section 6.10 of MARSSIM, and specifically Section 6.10.2. C. Petullo suggested that three or four broad comments be prepared and provided to C. Gogolak for him to use in preparing a second draft of the FAQ.

The questions need to stand alone, and the response needs to clearly address the question. For example, the second question in the draft FAQ refers to the response to the first question so it is not stand alone.

The questions need to focus directly on the purpose of the FAQ. There needs to be a clear reason why the question is being asked relative to the purpose. The purpose of the FAQ is to notify users that scan data can be used for demonstrating compliance, but the data need to meet the DQOs. Examples of questions include “Can I demonstrate compliance with a dose- or risk-based release criterion when I only have scan data?” “What are the requirements for a scan-only survey?” “What does 100% scan coverage mean?” “When should I decide to use a scan only survey instead of a combination of scan and fixed measurements or samples?”

The response to the second question states the no decision is usually made based on scan data. However, the response to the last question on the first page states that scan instruments are used to make a detection decision. The wording needs to be changed to correct this inconsistency.

The response to the first question on the second page (What is the purpose of collecting direct measurements or sample data...) requires that the MDC for direct measurements or scans be no more 10-50% of the DCGL_w. The word “scans” should be changed to “samples”.

The responses to the questions need to start with the answer to the question (e.g., yes, no, it depends). The responses sometimes drift into other topics that do not directly relate to the question being answered. The responses should provide adequate detail to answer the question without branching out into different topics.

R. Bhat requested a separate FAQ be developed to discuss the reliability of individual scanning instruments and other instruments (e.g., global positioning systems) used to collect data for radiological surveys. This FAQ would supplement information in Appendix H of MARSSIM. This request was placed in the parking lot.

CASE STUDY 1

The contractor described the revisions to Case Study 1 based on comments from the Workgroup. The scenario was changed from decommissioning a site where the buildings were intact to a renovation scenario where the concrete floor had been removed. The contractor requested that the Workgroup provide comments on the overall presentation of the Case Study (e.g., format, content) as well as a technical review of the draft. This will allow the contractor to proceed with the development of additional Case Studies using the same general approach.

The Case Study format should follow the outline provided by E. Boulos. K. Snead pointed out that the introductory sections (i.e., Case, Objectives, Approach) were not included in the draft.

The Workgroup discussed the possibility of developing “summary tables” to highlight the important examples within each Case Study. This idea was added to the parking lot for future discussion. The Case Study should be reformatted to become Chapter 7. The outline of Chapter 7 will include an introduction describing the purpose of the Case Studies. Each Case Study will be in a separate section and follow the outline provided by E. Boulos. The tables need to be introduced in the text before they just “appear” in the Case Study.

The Workgroup discussed the identification of impacted M&E in the Case Study. G. Powers requested a better explanation of why the concrete was considered impacted. S. Doremus suggested that a clear statement of what is impacted and what is non-impacted could be included in Section 1.1.

The statement in Section 1.5 that sentinel measurements are not applicable to bulk materials was questioned by the Workgroup. The definition of sentinel measurements from the glossary was discussed. N. Azzam pointed out that there is some text in Chapter 2 that clarifies the use of sentinel measurements, and this clarification should be added to the glossary definition. The first sentence in Section 1.5 will be changed to “For this example, the bulk material was processed so there is no justification for the use of sentinel measurements.” D. Caputo added that the work group should be careful in using the term bulk material, as it is a DOT definition. He clarified that the Workgroup is referring to process bulk material.

D. Caputo stated there is no conceptual model when it is first mentioned on Line 88, but rather just initial assessment (IA) assumptions. Section 1.7 should provide the final description of the M&E (see Chapter 2 outline in these minutes), including the size of the rubble. S. Doremus and R. Meck discussed that rubble of mixed size may necessitate multiple types of detection equipment to adequately characterize the residual radioactivity. R. Meck also stated that processing the rubble (i.e., to ensure homogenous rubble size) would make the material easier to characterize. The contractor pointed out that Figure 3.3 (selecting a measurement method) provides for modifying the M&E (e.g., crushing or chopping) to reduce measurement uncertainty, and additional processing of the M&E would appear in later sections of the Case Study. Section 1 of the Case Study provides a description of the M&E to support a decision of whether additional processing is necessary. A better description of the crushed concrete could occur in Section 1.2 or Section 1.7.

The Workgroup discussed the radionuclides of potential concern described in Section 1.7.1. Lines 77-78 need to include a statement that some of the decay products may not be in equilibrium as a result of the chemical processing performed on the ore. This means that surrogates may not be appropriate unless a preliminary survey is performed to determine the equilibrium status of the uranium and thorium decay series. This objective for the preliminary surveys needs to be clearly stated. The range of concentrations listed in the table requires additional justification, since it is outside the range of what was present in the raw ore. Some of

the discussion on the chemical processing potentially concentrating some radionuclides that was removed to address earlier Workgroup comments needs to be included in Section 1.4.

A discussion of segregation needs to be included outside of the summary table describing the M&E. This discussion should identify the need to separate the rebar from the concrete. The physical description of the M&E needs to describe the existing conditions for the concrete in detail.

Table 1-2 includes a statement that hot spots are not a problem because of the action level. At this point in the survey design process the action level has not been selected, so this statement is premature. MARSSIM and MARSAME do not use the term hotspot, which should be replaced with small area of elevated activity. This statement should be removed and replaced with a more general statement.

Lines 102 to 107 in Section 1.8 refer to the use of a G-M detector. The detector should be specified (i.e., G-M pancake with a ratemeter). This detector can be used to survey individual chunks of concrete. However, the contractor should consider using a NaI detector to investigate bulk quantities of rubbleized concrete instead of a G-M detector. The rubbleized concrete can be arranged in a thin layer and the survey can be performed similar to a gamma walkover survey for surface activity in MARSSIM. There should be a statement that the reference concrete is from a similar time frame as the concrete being investigated, so it is a reasonable reference material. The first block states that activity is expected to be at limited depth. However, the earlier descriptions stated that there were cracks in the floor where activity could have penetrated deeper into the concrete. These discussions need to be consistent.

The “<” symbols should be removed from the MDC values in the table. Section 1.8 needs to specify the required MDC for the preliminary surveys, possibly based on the range of expected activity and MARSSIM guidance (i.e., 10-50% of the action level). The purpose for performing the preliminary surveys needs to be clearly stated (e.g., to determine equilibrium conditions, to establish background). Chapter 2 should include guidance on specifying the objectives for the preliminary surveys.

Section 1.10 lists 2 nCi/g as an action level for ²²⁶Ra. The Workgroup requested the 5 pCi/g level from UMTRCA be used for this example. In line 130, the phrase “orders of magnitude greater” should be changed to “much greater.” The final list of radionuclides of concern requires more discussion. The process of reducing the list of 26 radionuclides in the uranium and thorium decay series from Table 1-2 to the three surrogates that will actually be measured needs to be explained in detail. There should be a list of radionuclides of concern that will be measured during the disposition survey included in Section 1.

423 R. Bhat discussed measurement uncertainty and how it affects the decision that isotopes are in
424 equilibrium. The Workgroup decided that this level of detail was not required for the Case
425 Study.

426 The idea that bulk material is volumetrically contaminated needs to be clarified in Line 151. The
427 sentence from the box on page 6 can be moved to Line 151 to clarify this idea.

428 In Section 2.1.1, the calculation on line 196 needs to be written as an equation. The statement
429 “mixing of small volumes” on line 210 incorrectly implies dilution. Ensure the description
430 makes it clear that this processing is performed to homogenize the concrete to reduce the
431 uncertainty in the measurements, and is part of the normal processing performed on this type of
432 M&E. Use the term “blending” instead of “mixing.” The Workgroup suggested rewording as
433 “in the course of normal processing and preparing the concrete for measurement, the activity will
434 be homogenized” or something similar.

435 Section 2.2.1 discusses the selection of survey unit boundaries. The process includes selecting a
436 survey unit size based on the assumptions used to develop the action level (i.e., NUREG-1640
437 for this example). The survey unit boundaries can be modified (see flowchart in Figure 3.2)
438 based on measurement requirements. The Workgroup requested that a thickness other than 15
439 cm be used for this example to prevent the assumption that 15 cm is the only acceptable
440 thickness. The thickness of a FIDLER crystal on Line 222 should be 1.16 mm, not 5 inches.

441 The equations in Section 2.4 should include references to NUREG-1507. The reference at the
442 beginning of this section may be modified to clarify that all of the equations come from the same
443 reference, or the reference may be included for individual equations.

444 Global search the document and remove the word “contamination.”

445 On Line 414, replace typical background with the actual background measured during the
446 preliminary survey.

447 There were several specific comments made by members of the Workgroup that are not listed
448 here. These comments will be addressed in the next revision of Case Study 1.

449 The Workgroup discussed additional Case Studies that will be included in Chapter 7. The Case
450 Studies will address the three types of documentation for survey designs discussed in the outline
451 for Chapter 4 in these minutes.

452 Case Study 1 is an example of a decommissioning application, which in this example is a
453 renovation scenario.

Case Study 2 will provide an example of an operational survey, where tools or trash are being released from an operating nuclear power plant. The description of the M&E from the IA will be compared to an existing SOP survey design to determine if that survey design is appropriate.

Case Study 3 will provide an example of a special survey, and will look at interdiction and clearance surveys for rented heavy equipment. The contractor will consider whether the renovation scenario can be used for this example to reduce the amount of background information (e.g., the IA for the site will already be complete).

SCHEDULE

The Workgroup discussed the schedule for completing the development of the MARSAME supplement. The contractor proposed a schedule to complete the Intra-Agency Review Draft by June 2005 with five meetings of the Workgroup. This is an aggressive schedule that requires significant commitment from the Workgroup. The Workgroup decided to wait until the next Workgroup meeting to gauge the progress on completing the supplement.

Chapter 1	Delivered to Workgroup 11/30/04	Comments due on Website 1/3/05
Glossary	Delivered to Workgroup 11/30/04	Comments due on Website 1/3/05
12/04 Meeting Minutes	Deliver to Workgroup 12/10/04	Comments due on Website 1/3/05
SOP Survey Design for Case Study 2	Deliver to Workgroup 1/17/05	Discuss During 1/26/05 Conference Call
Chapter 2	Deliver to Workgroup 2/1/05	Comments due on Website 2/7/05
Chapter 4	Deliver to Workgroup 2/1/05	Comments due on Website 2/7/05
Chapter 3	Deliver to Workgroup 2/18/05	Comments due on Website 3/4/05
Conference Call	Wednesday 1/26/05 1 pm to 3 pm EST 10 am to Noon PST	Finalize 12/04 Minutes Discuss SOP for Case Study 2
Workgroup Meeting	2/14/05 to 2/17/05 EPA, Washington DC	Review Comments on Chapter 2 and Chapter 4 Discuss Development of Chapter 5 and Case Study 2 Possibly discuss the Scan Only FAQ for MARSSIM and a proposed outline for Chapter 6

ADJOURN

Meeting Date: December 3, 2004
Date Prepared: December 9, 2004

**MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL
(MARSSIM) WORKGROUP MEETING NOTES - DRAFT**

FRIDAY, DECEMBER 3, 2004

ATTENDEES:

U.S. Environmental Protection Agency - OSWER/ERT-West: C. Petullo
U.S. Environmental Protection Agency - Headquarters: K. Snead
U.S. Environmental Protection Agency - Headquarters: L. Bender
U.S. Environmental Protection Agency - NAREL: V. Lloyd (by phone)
U.S. Environmental Protection Agency - Region II: N. Azzam
U.S. Nuclear Regulatory Commission - RES: R. Meck
U.S. Nuclear Regulatory Commission - RES: G. Power
U.S. Air Force: R. Bhat (by phone)
U.S. Air Force: Major D. Caputo

MEMBERS OF THE PUBLIC:

Cabrera Services, Inc.: S. Hay (U.S. Air Force Contractor)

CHAPTER 2

The contractor described the revisions to Chapter 2. Section 2.3 on preliminary surveys and Section 2.6 on segregation had been added for this revision. A flowchart, Figure 2.1, was added to this revision as well.

The Workgroup discussed preparation of M&E for measurement and where guidance should appear in the supplement. Chapter 2 should introduce the concept where preparation may be combined with segregation (e.g., segregating concrete and rebar will also homogenize crushed concrete), but reference later sections for more detailed discussions. Chapter 3 should discuss the theoretical process of preparing M&E for measurement to reduce measurement uncertainty. Chapter 5 should provide practical guidance for physically modifying M&E for measurement. All preparation discussions should emphasize preparation for measurement and homogenization and avoid any implication that this is dilution.

The discussion of measurement uncertainty expanded to include segregation. The purpose of segregation is to reduce measurement uncertainty. This is similar to defining survey unit boundaries, where the purpose is to reduce spatial variability. The combination of segregation and defining survey unit boundaries helps control total uncertainty in the final disposition decision. Section 2.6 should be expanded to discuss segregating M&E based on both physical and radiological characteristics. For example, M&E associated with alpha emitters should not be combined with gamma emitters and concrete rubble should not be combined with hand tools. The guidance needs to clearly distinguish segregation from defining survey unit boundaries and preparing M&E for measurement.

The example in Case Study 1 could be performed in two stages. The initial pile of rubble would contain concrete of various sizes combined with rebar, and some of the chunks could be significantly more radioactive than others. A preliminary survey could be performed prior to stripping the concrete from the rebar to segregate the large chunks of concrete that contain significant levels of radioactivity. The preliminary survey design would need to specify action levels (probably based on background with hand held NaI detectors) and address handling issues.

The Workgroup will continue reviewing the current draft of Chapter 2 and post comments on the website by January 3, 2005. The next revision of Chapter 2 will be provided to the Workgroup by February 1, 2005 for discussion at the February Workgroup meeting,

CHAPTER 5

The Workgroup discussed the content and structure of Chapter 5 based on the modifications proposed for other chapters during the meeting. The minutes from the March 2004 Workgroup meeting when the current version of Chapter 5 (Chapter 6 at that time) was discussed were reviewed. The Workgroup developed a possible outline for Chapter 5. This outline will be discussed at the February 2005 Workgroup meeting before Chapter 5 is revised.

CHAPTER 5

- 5.1 Introduction
- 5.2 Scanning With Hand-Held Instruments
 - 5.2.1 Instruments
 - 5.2.2 Temporal Issues
 - 5.2.3 Spatial Issues
 - 5.2.4 Radiation Types (include neutron)
 - 5.2.5 Range
 - 5.2.6 Scale
 - 5.2.7 Uncertainty
 - 5.2.8 Detectability (MDC)

544	5.2.9	Quantifiability (MQC)
545	5.2.10	Quality Control
546	5.3	Direct Measurements with Hand-Held Instruments
547	5.4	Box Counters
548	5.5	Automated Scanning
549	5.6	In Situ Gamma Spectrometry
550	5.7	Portal Monitors
551	5.8	Sample with Laboratory Analysis
552		Sections 5.3 through 5.8 have the same subsections as Section 5.2
553	5.9	Data Conversion
554	5.10	Health and Safety
555	5.11	Handling M&E (Process Flow)
556		Include guidance on assigning measurement locations (random, systematic, fixed, scan)
557		ADJOURN

ACTION ITEMS

558

559	All	Review Chapter 1, Chapter 2, Glossary, 12/04 Minutes and post comments on website by 1/3/05.
560		
561		Review SOP for Case Study 2 for Conference Call on 1/26/05.
562		Review Chapter 2 and Chapter 4 and post comments on website by 2/7/05.
563	K. Snead	Set up meeting in DC for 2/14/05 to 2/17/05.
564	R. Meck	Set up conference call for 1/26/05. Twelve lines from 1 to 3 eastern.
565	S. Hay	Prepare draft minutes from 12/04 meeting by 12/10/04.
566		Provide Chapter 1, Chapter 2, Chapter 3, Glossary, for posting on website by 12/10/04.
567		
568		Prepare revisions of Chapter 2 and Chapter 4 by 2/1/05.
569		Download comments on Chapter 2 and Chapter 4 from the website after 2/7/05,
570		prepare list of comment resolutions for editorial comments, and list of comments
571		requiring Workgroup discussion for distribution at the Workgroup meeting on
572		2/14/05.
573		Prepare revision of Chapter 3 by 2/18/05.
574	N. Berliner	Prepare SOP for Case Study 2 by 1/17/05.
575		Prepare revision of Case Study 1.
576		Prepare questions for discussion or preliminary outline for Case Study 2 for
577		distribution at the Workgroup meeting on 2/14/05 based on 1/26/05 conference
578		call.

PARKING LOT

579

580 Class 3 definition in MARSSIM may need adjustment to cover the “simple” case where the
581 relative shift is very large, which may become the definition of Class 3.

582 Develop an FAQ on classification to decide when an area is Class 2 and not Class 1 or Class 3.

583 Given a classification of Class 2 or Class 3, provide a % scan to release. Determine whether
584 scan coverage can be 0% in Class 3 areas.

585 Should MARSAME include prior knowledge (process knowledge) to design a disposition survey
586 using a Bayesian approach?

587 Develop a range of expected values for radionuclide relationships that may be used for surrogate
588 measurements.

589 Where are survey unit boundaries finalized, Chapter 3 or (new) Chapter 4?

590 Perform a pilot study to evaluate the MARSAME guidance. Suggested locations include Nellis
591 AFB and Hunters Point Naval Shipyard. OSWER may perform pilot study for chemical
592 contaminants.

593 Include the concept of “clean-as-you-go” in MARSAME.

594 Develop an FAQ on reliability of individual scanning instruments and other equipment (e.g.,
595 global positioning system) used to collect data during radiological surveys.

596 Develop tables summarizing the important examples from the Case Studies.